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Roger Sperry: new mindset on consciousness

In the mid 1960s, Roger Sperry, whose research on the brain was to radically change our view of how the mind works, began to revise his own views about the implications of his research. Then the Hixon Professor of Psychobiology at Caltech, Sperry would receive the 1981 Nobel Prize for showing that two kinds of consciousness seem to exist in the human brain—a verbal, analytical "logical" consciousness localized in the left hemisphere; and a more spatial-visual "intuitive" consciousness in the right.

As a scientist, Sperry says, he had accepted the traditional view that a complete description of how the brain functions can be achieved by focusing exclusively on the action of its nerve cells and its biochemistry, without taking into account the quality of conscious thought that characterizes the human mind. But, by the late 1960s, partly as a result of the split-brain studies, he began to re-evaluate this thinking. He gradually broke with the rigorously objective behaviorist school, which had imported the approach of the physical sciences wholesale into the study of the mind and human behavior. In its place, he advocated treating mental states and experiences—which the behaviorists had dismissed as irrelevant—as agents that exercise an active, controlling influence on the physical functions of the brain. By the mid 1970s, this approach, known in psychology as cognitivism or mentalism, had been adopted by a large segment of the behavioral and human sciences in what has come to be called the "consciousness revolution."

Even today, Sperry notes, many hard scientists mistakenly equate this outlook with a semi-mystical approach to science. "It's certainly been stated over and over," he says, "that there's nothing in this view to encourage a supernatural interpretation of how the mind or the world works. On the contrary, it's my view that mentalism provides the first truly scientific basis for upholding the importance of human thought processes and values in the world we live in."

In this article, based on a recent interview with Heidi Aspaturian, Sperry talks about his present outlook and the implications of the cognitive or mentalist revolution for scientific thought and human behavior.

Roger and Norma Sperry's interests beyond the mind-brain question include the excavation of fossil ammonites. This 5½-foot, 70-million-year-old specimen that the Sperrys found in the Mexican Rio Grande is a contender for the third largest in the world.

As a brain researcher, I'd started out simply accepting the strictly objective principles of the behaviorist position. In the 1950s and early 1960s, all respectable neuroscientists thought in these terms. In those days, we wouldn't have been caught dead implying that consciousness or subjective experience can affect physical brain processing.

My first break with this thinking— although I certainly didn't see it that way at the time—came in a 1952 discussion of mind- brain theory in which I proposed a fundamentally new way of looking at consciousness. In it, I suggested that when we focus consciously on an object—a mental image for example—it's not because the brain pattern is a copy or neural representation of the perceived object, but because the brain experiences a special kind of interaction with that object, preparing the brain to deal with it.

I maintained that an identical feeling or thought on two separate occasions did not necessarily involve the identical nerve cells each time. Instead, it is the operational impact of the neural activity pattern as a whole that counts, and this depends on context—just as the word "lead" can mean different things, depending on the rest of the sentence.

A major influence on my thinking was biologist Lloyd Morgan's writings on emergent evolution, dating back to the 1920s. The central point of this thesis is that when parts come together in a new whole, this new whole exhibits features—emergent properties—that can't be predicted as a rule from the parts, and cannot be explained entirely in terms of the parts. In this context, consciousness and other subjective qualities, such as ideas, feelings, values, and emotions that we associate with "mind," could be thought of as emergent properties of the physical brain. They could also be understood—and this was the novel step—as having an actual functional role in brain processing.

I didn't see this last implication in the 1950s, when I was occupied mostly with research at the experi-

mental level; but in the 1960s this changed. Under the pressure of writing up my results for two invited talks, I was forced to re-think the whole mind-brain question. From an experimental standpoint, the problem came to a head when we found that once you cut communication between the brain's left and right hemispheres by surgically severing the band of fibers that connect them, there were certain experimental settings in which our subjects appeared to be experiencing two independent consciousnesses under a single cranium. Each side of the surgically divided brain apparently had a mind of its own that was not a party to any of the experiences of the other hemisphere.

Now, how did this work—did it imply that with a knife you can create a second consciousness or reveal its presence? It seemed to me a better solution could be seen in terms of emergent properties. When the brain is whole, the unified consciousness of the left and right hemispheres adds up to more than the individual properties of the separate hemispheres. So these studies raised the issue of consciousness in a new way. What we saw, in brief, was emergent control—control from above downward—in the context of brain function. I described this view as one which places mind in the driver's seat in the brain, in command over matter.

Science traditionally takes the reductionist approach, saying that the collective properties of molecules, or the fundamental units of whatever system you're talking about, are enough to account for all of the system's activity. But this standard approach leaves out one very important additional factor, and that's the spacing and timing of activity—its pattern or form. The components of any system are linked up in different ways, and these possible relationships, especially at the higher levels, are not completely covered by the physical laws for the elementary interactions between atoms and molecules. At some point, the higher properties of the whole begin to take over and govern the fate of its constituents.

A simple way to illustrate this idea is to imagine a molecule in an airplane flying from L.A. to New York. The molecule may be jostled somewhat or held in position by its neighbors, but these lower-level actions are trivial compared to its movement as the plane flies across the continent. If you plot the movement of the molecule through time and space, those features governed by the higher properties of the plane as a whole make those controlled at the level of the molecule insignificant by comparison. The higher properties control the lower, not by direct intervention, but by supervention.

I first spelled out this new view of consciousness in a public talk at the University of Chicago in 1965, and it met with a terrific reception. That same year I tried almost exactly the same speech in a Watson lecture at Caltech, and it went over more like a lead balloon. Occasionally I've heard surprise expressed that this sort of thinking—which is often interpreted as an intrusion of philosophy into the sciences—should arise at, of all places, Caltech.

I continued to push these views, though, in the following years in talks and papers at the National Academy of Science and in neuroscience and psychology. By the mid 1970s, psychology had come round to the view that mental states are causal— that is, that they play an active operational role in brain function.

This shift in emphasis also meant that these arguments no longer reflected just my personal philosophy, but had become the working framework of a whole scientific discipline—the one that specializes in mind and behavior.

After the considerable early criticism I had encountered in the scientific community, this turnabout in psychology provided some highly welcome reassurance. At this point I had to decide whether to continue giving priority to split-brain studies, or to make my priority the new view of consciousness. Both were full-time projects, and I have a very one-track mind that needs to concentrate. I asked myself which issue is more important: whether mental states are more left- or right-hemispheric, or whether they are causal in brain function. From weighing the pros and cons, I decided that the left-brain, right-brain work was well in orbit and that it would be more important to shift my primary focus to consciousness.

The mind-brain issues are intrinsically more compelling. They carry strong humanistic as well as scientific implications. I could foresee changes in our world view, guiding beliefs, and social values. In the context of today's worsening world conditions and our imperilled future, this work seemed far more important than whether you can find a brain theory enabling people to learn faster, draw better, make better medical diagnoses, and so on.

We're beginning to learn the hard way that today's major global ills ence and technology. Technical solutions, in the absence of world population controls, only tend, over time, to escalate the problem. What is needed to break the vicious spiral is a worldwide change in attitudes, values, and social policy. As Einstein put it, "We need a substantially new manner of thinking if mankind is to survive."

The new outlook has promising qualifications in this direction. Instead of maintaining the traditional separation of science and values, cognitive theory says the two come together in brain function. If we are correct in saying that our conscious mental values not only arise from, but also influence brain processing, then it becomes possible to integrate values with the physical world, on a scientific rather than supernatural basis. It's been the traditional role of religion to affirm the primary importance of our higher values in this world, by invoking a supreme power. In cognitivism, it is science that affirms the powerful controlling role of higher values, and it is able to do so on grounds that are verifiable—that is, testable against reality as it really is.

On these new terms, science no longer upholds a value-empty existence, in which everything, including the human mind, is driven entirely by strictly physical forces of the most elemental kind. We get a vastly revised answer to the old question "What does science leave to believe in?" that gives us a different image of science and the kind of truth science stands for. This new outlook leads to realistic, this-world values that provide a strong moral basis for environmentalism and population controls and for policies that would protect the long-term evolving quality of the biosphere.

On another level, cognitivism bridges the chasm between what the writer C.P. Snow has called the "two cultures"—the widening gap between the world view of the scientist and the humanist. The Caltech philosopher W. T. Jones has called this *the* crisis of contemporary culture.

Actually I think time will show that the new approach, emphasizing emergent "macro" control, is equally valid in all the physical sciences, and that the behavioral and cognitive disciplines are leading the way to a more valid framework for all science. Although the theoretic changes make little difference in physics, chemistry, molecular biology, and so on, they are crucial for the behavioral, social, and human sciences. They don't change the analytic, reductive methodology, just the interpretations and